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Monday, April 17, 1837.

Henry HALLAM, Esq., Treasurer, in the Chair.

The names of the Right Hon. Holt Mackenzie; George R. Porter, Esq.; Col. Sykes, and Thomas Tooke, Esq.; were announced as the four Vice-Presidents nominated by the President for the present year, in accordance with the regulations of the Society.

The following gentlemen were balloted for, and were elected Fellows of the Society:—

Henry English, Esq., 37, New Broad Street, City;
Frederic Purdy, Esq., 1, Somerset Place, Strand;
William Foster, Esq., 17, Whitehall Place;
Henry Buckley, Esq., River Hill, Seven Oaks;
John A. Hankey, Esq., 36, Brook Street;
John Hardwick, Esq., Albany;
Captain Williams, Strand-on-the-Green;
Baldwin F. Duppa, Esq., Lincoln's Inn;
Stevens Wade Henslow, Esq., Clement's Inn, Westminster.

The following Papers were then read and laid upon the Table:—

A Report of the Committee on Medical Statistics, stating that the Committee had been chiefly engaged in preparing queries for the future collection of facts relating to the Statistics of Medicine, and in suggesting such forms for the registration of information as may produce uniformity in the abstracts, and lead to the most useful and practical results. The report explained a tabulated statement, prepared by the Committee, of the number and particulars of cases of suicide in Westminster, which have been subjects of Coroners' Inquests from January, 1812, to December, 1836. The Committee, it was stated, had obtained from the Home Office a list of Coroners in England

and Wales; and had been furnished with several Statistical accounts relating to the Lying-in-Charity attached to Guy's Hospital.

A Report of the Committee on Criminal Statistics was read:—It stated that the Committee had completed, and accompanied with an elaborate explanatory paper, a set of forms for the future registration of all desirable information respecting the condition and character of persons charged with offences, the nature of their offences, and the circumstances which have led to their perpetration, with the results of the investigation or trial.

A Return to the Society's printed questions was briefly read and laid upon the table:—It contained a series of answers relating to the township and parish of Winwick in Lancashire, prepared by Robert Atherton Hornby, Esq.

A communication was read from the Secretary of the Statistical Society of Manchester, giving an account of the formation, constitution, and progress of that Society.

A communication was read from the Secretary of the Statistical Society of Bristol, giving a similar account of that Society.

A Paper was then read, prepared by T. R. Edmonds, Esq.

ON THE INFLUENCE OF AGE ON THE MORTALITY OF THE POPULATION OF SWEDEN.

Human Society, said Mr. Edmonds, is constituted by a succession of individuals entering by birth and removed by death. The permanency of a population depends, on the receiving of supplies through birth, sufficient to compensate the losses through death. This state may be correctly represented by a close reservoir receiving water through one pipe, and discharging it through a second pipe. The water contained in the reservoir, will represent a stationary population, if the pipe of influx be equal to the pipe of efflux. By means of Statistical observations, the relation between the size of the equal pipes and the dimensions of the reservoir, has been ascertained. If through each of the equal pipes be transmitted, in one year, a quantity of water equal to the *fortieth* part of the water constantly contained in the reservoir, we shall have a true representation of a stationary human society.

In order that the comparison may be accurate, it is necessary to take into consideration the time during which each particle may remain in the reservoir of water or life. Some remain only an hour, others a hundred years. This might be the case, if the chances of entering the pipe of efflux or death were equal for all individuals at whatever age from entrance; but it is a fact established by all Statistical observations on this subject, that the chance of falling into the pipe of efflux is very great immediately after birth, that this chance is very low at the age of 10 years, and again very high at advanced ages. The influence of age on the mortality, may be represented by the following kind of motion among the particles in the reservoir. Those just admitted, revolve in circles passing close to the point of danger (the orifice of the pipe of efflux); as these particles advance in age, the distance of their circles from the point of danger gradually increases, until after a certain time, as 10 or 15 years, the circles of revolution again approach the point of danger with a velocity continually accelerated. This representation of the influence of age, is in conformity with every Statistical observation on mortality, although this influence has not been supposed capable of being precisely and mathematically expressed. The object of the present remarks was to show that the forces of removal from, and of attraction to, the point of danger, admit of exact numerical estimate, in the case of Sweden. By the help of other observations the Author would show, that these forces are probably the same in all populations.

The relation between the dying and the living, without distinction of age, has been frequently ascertained in various populations: but the instances are very rare in which the mortality at different intervals of age has been ascertained by direct observation. In comparing the mortalities of different nations, the quotients of the total deaths by the total numbers living are usually adopted as the sole ground of comparison. The quotients of the number dying at each age, by the number living at the same age, have been rarely obtained by direct observation.

In the majority of nations, it is found by calculation that the part of the population under the age of 5 years suffers a yearly mortality of 8 per cent., that the part of the population between the ages of 10 and 15 years suffers a yearly mortality of only *two-thirds* of one per cent., and that the part of the population at the age of 55 suffers a yearly mortality of 2½ per cent., which is nearly equal to the mortality of the aggregate population without distinction of age.

Among the very few observations in existence, from which can be directly determined the mortality at every age of life, those collected by SWEDEN hold the first place, and are the only ones which supply the means of comparing, at distinct intervals of age, the mortality suffered by the same nation at distant periods of time. From the year 1755 to the present time, the living and the dying of the Swedish population have been periodically enumerated and classified in quinquennial gradations of age. It is only within the last two or three years, that any nation has made an attempt to present facts on mortality similar to those which Sweden has been presenting to the world for the last 80 years. England is one of these competing nations, but the observation here, besides being isolated, is imperfect, from being founded only on one enumeration of the living distinguished according to age, in 1821. Belgium is the only other nation which has attempted to imitate Sweden, but the period for which the ages of the deaths have been observed in that kingdom is only three years. In England the ages of the deaths have been observed for a period of 18 years. In Belgium, as in England, there has never been made more than one enumeration of the living distinguished according to age. In Sweden, the returns are nearly perfect, and leave nothing to be desired except a distinction of the deaths occurring in the first and second month after birth. From these returns we are enabled to state positively, the mortality which has been suffered at any age for either sex, during any part of the last 80 years.

Eight Tables drawn up by Mr. Edmonds, and displaying the influence of *Age* and *Sex* on the mortality of the population of *Sweden* throughout 71 years ending with 1830, were here referred to. They are printed at the end of the present Abstract.

The theoretical portions of these tables, constructed by Mr. Edmonds in accordance with the formula which he had developed and reduced to an algebraical expression, were shown to coincide in the most satisfactory manner with various statistical exhibitions of mortality, with which they have been compared ; and the author especially noticed their coincidence with the statements of M. Hoffmann in the paper published in the first part of the Society's Transactions.

According to the tables in most common use, the mortality under the age of one year, is generally as 20 out of 100 born ; at the age of 10 years it is always less than one per cent. ; at the age of 80, the annual mortality is seldom lower than 15 out of 100 surviving to this age. The question deserving consideration is, whether the mortality at the three above mentioned periods being known, the mortality at any intermediate age may not be calculated therefrom.

The paper then proceeded to develope the fact that three constant proportions exist in the increase and decrease of mortality at certain ages ; and that the three periods over which these *constants* preside correspond to the three—before, during, and after, the existence of the power of propagation : namely, that, from the age of one to seven the mortality diminishes one third, or thirty-two and a half per cent. every year; that from the age of ten to fifty it increases three per cent. every year; and that beyond the age of sixty it increases eight per cent. every year. The remarks explanatory of this theory of *constants,* and of the determinate periods over which they respectively extend, occupied a large portion of the paper.

The mathematical and necessary consequence, of the existence of the three above mentioned *constants* is that, the rate of mortality at any one age being known, the rate of mortality at every other age is also known, and that the proportion surviving to any age (x) is, in every population, represented by the formula

$$y_x = 10^{\frac{k^2 \alpha}{\lambda p}\left(1 - p^x\right)}$$

The quantity (α) is the only one to be determined by observation, and has different values for different populations. By means of this formula may be directly formed what is technically called a "Table of Mortality," which consists in a statement of the number surviving at yearly intervals, out of a given number living at any specified age.

The three following tables, "Village," "Mean," and "City" mortality, which are compared with the English and Swedish observations, were constructed from the same formula by taking three different values of (α) in the proportion of 5, 6 and $7\frac{1}{2}$. The mean age at which the first constant ceases, is 8 years, and the age at which the second constant ceases to be used, is 55 years in the three tables. The Village table represents the lowest rate of mortality ever observed; the City table is given as the representation of the highest mortality ever observed, except among the poorest inhabitants of large towns. Numerous other remarks, explanatory and inferential, were given as a commentary on the accompanying tables.

Contents of Eight Tables displaying the influence of *Age* and *Sex* on the mortality of the population of *Sweden* throughout 71 years ending with 1830.

TABLES 1 & 2.—Showing the distribution in quinquenial gradations of age, of the numbers Living and Dying in Sweden, at different parts of the 25 years ending with 1830. (From a recent communication, to the writer of this article, by the official authorities in Sweden.) Table 1. for the Male sex. Table 2. for the Female sex.

TABLES 3 & 4.—Showing in quinquennial gradations of age for three periods of 20 years each, the mean number *Living* and the mean number of *annual deaths.* Table 3. for Males. Table 4. for Females.

TABLE 5.—Showing, for three periods of 20 years each, the mean number dying annually out of 100 living in every quinquennial gradation of age—being the results obtained by dividing the mean annual deaths, by the mean numbers living:—exhibited in tables 3 and 4.

TABLE 6.—Showing, for each sex during six periods, beginning with 1755 and ending with 1830, the mean number dying annually out of 100 living in each decennial interval of age.

TABLE 7.—Showing, for each sex during two periods of 41 and 20 years, the mean annual rate of mortality in Sweden in decennial intervals of age,—with which is compared the mean annual rate of mortality in England and Wales during the 18 years 1813-30.

TABLE 8.—Showing the *vitality* of the Swedish population, indicated by the enumerations of the living, independently of the registers of deaths:—the numbers representing the proportions surviving in 1820 and 1830, out of every 100 enumerated at ages

10 years younger in 1810 and 1820. (No similar table of facts has yet been published.)

⁂ The third part of the materials and results now presented, is entirely new to the public. The remaining two-thirds of the materials have not, I believe, been yet published *collectively* ; nor have the results been published in the form now adopted. In the present tables is offered a combined view of all desirable facts relating to the mortality at different ages in Sweden, from the year 1755 to the year 1830.

Tables 1 & 2.—Showing the distribution, in quinquennial gradations of age, of the numbers Living and Dying in Sweden, at different parts of the 25 years, ending with 1830. (From a recent communication, to the writer of this article, by the Swedish official authorities.

TABLE 1.—MALE SEX.

Between Ages.	Males Living in the year			Males Dying in five years.				
	1810	1820	1830	1806-10	1811-15	1816-20	1821-25	1826-30
0— 5	139568	169239	192565	68019	63830	62006	60576	67838
5—10	120157	130351	170878	9745	6064	6025	4904	6751
10—15	118711	115187	145150	5896	3701	3073	2741	3235
15—20	112241	115465	130368	5151	3707	3364	2834	3180
20—25	92534	110730	107122	6438	4899	4526	4151	4698
25—30	85065	105308	106353	6142	4743	4429	4545	5709
30—35	82641	88115	102105	6064	5314	4354	4763	6774
35—40	68454	77979	93658	6174	5422	5127	4667	7090
40—45	65434	73443	76441	6928	5888	5671	5766	7384
45—50	61056	57873	64762	7834	6930	5694	5902	8047
50—55	54173	53463	58901	9403	7987	7110	6265	8581
55—60	47040	46413	43507	9754	8418	7826	7304	8225
60—65	35227	37409	36505	10517	9654	9093	8342	9831
65—70	23671	28438	28246	9283	9054	9136	8432	10223
70—75	15014	17469	18765	9177	8020	8415	8459	10168
75—80	8480	8334	10459	7528	6091	5885	6043	8201
80—85	3399	3157	3934	4619	3875	3563	3533	4787
85—90	937	911	1009	1888	1516	1550	1343	1610
above 90	206	191	193	466	375	413	449	442
All Ages.	1134008	1239475	1390921	191026	165488	157260	151019	182774
0—1	33821	37079	40983	42213	41727	41044	41578	45625
1—3	52006	67287	79054	17569	16282	15241	13992	15818
3—5	53741	64873	72528	8237	5821	5721	5006	6395

TABLE 2.—Showing the same for the FEMALE SEX.

Between Ages.	Females Living in the year			Females Dying in five years				
	1810	1820	1830	1806-10	1811-15	1816-20	1821-25	1826-30
0— 5	140431	168313	192351	59957	55831	52922	52062	58317
5—10	120295	131518	169870	8870	5838	5497	4771	6111
10—15	117954	115626	145247	5114	3437	2961	2744	3029
15—20	114644	116868	132925	4896	3766	3373	2889	3130
20—25	106073	114758	110585	5069	4274	4253	3457	3799
25—30	97104	111270	110261	5475	4297	4258	3897	4408
30—35	91589	97691	106088	5790	5060	4461	4156	5262
85—40	76515	87492	100661	6067	5208	5284	4382	5714
40—45	75753	83021	87263	6852	5425	5276	4825	5882
45—50	69913	66806	76528	6948	5710	4944	4482	6151
50—55	63155	63969	70808	8682	6995	6472	5165	7055
55—60	55700	57715	54435	9437	8147	7488	6572	7538
60—65	44184	48001	48958	11381	10102	9598	8721	10299
65—70	30390	38206	39092	10874	10449	10601	9427	11728
70—75	20382	24436	27008	11608	10055	10437	10009	12635
75—80	12311	12251	16028	10531	8226	7739	7864	11219
80—85	5371	5151	6794	6889	5748	5426	5005	6932
85—90	1711	1699	1824	3094	2553	2546	2213	2807
above 90	368	424	435	936	786	846	934	987
All Ages.	1243843	1345215	1497161	188470	161907	154385	143575	173003
0—1	33342	36052	40132	35520	34792	33769	34437	37813
1—3	52650	67287	79407	16615	15390	13674	12751	14414
3—5	54439	64974	72812	7822	5649	5479	4874	6090

Tables 3 & 4.—Showing in quinquennial gradations of age, for three periods of 20 years each, the mean number living, and the mean number of annual deaths, in Sweden with and without Finland.

TABLE 3.—For the MALE SEX.

Between Ages.	Males living (mean number.)			Males dying annually.			Mean No. living during 61 years.	
	21 years 1755-75	20 years 1776-95	20 years 1811-30	1755-75	1776-95	1811-30	Males.	Females.
0— 5	158733	190638	167653	15072	17411	12713	172341	173122
5—10	121871	141123	137934	1789	2009	1187	133643	134106
10—15	117879	138439	123559	898	943	638	126626	127291
15—20	103093	125753	118384	741	855	654	115743	119214
20—25	91907	118919	105279	874	1073	914	105368	114619
25—30	82919	109321	100509	879	1154	971	97583	106783
30—35	78615	101567	90244	955	1197	1060	90142	98267
35—40	70390	88928	79518	907	1118	1116	79642	87027
40—45	63961	81389	72190	1119	1302	1235	72513	80122
45—50	52083	67577	60391	1077	1299	1329	60017	67816
50—55	44908	60325	55000	1233	1448	1497	53411	62149
55—60	36253	49108	45843	1180	1468	1589	43735	52586
60—65	30772	40132	36638	1383	1766	1846	35847	45188
65—70	21170	27231	27198	1328	1790	1842	25200	33563
70—75	14610	17451	17179	1360	1627	1753	16413	22927
75—80	8224	9072	8902	1023	1192	1311	8733	12876
80—85	4036	3981	3412	784	755	787	3810	6051
85—90	1522	1317	942	383	324	301	1260	2125
above 90	486	372	195	195	128	84	351	643
All Ages.	1103432	1372643	1250970	33180	38559	32827	1242348	1346475
At Birth.	42017	50321	44322	1185	1559	——	45553	43300
0—1	33882	41406	37240	9664	10688	8499	37509	37118
1—3	62155	75148	66409	3592	4313	3067	67904	68386
3—5	62696	74084	64004	1816	2110	1147	66928	67618

TABLE 4.— Showing the same for the FEMALE SEX.

Between Ages.	Females Living, (mean number.)			Females Dying annually.			Mean annual deaths during 61 years.	
	1755-75	1776-95	1811-30	1755-75	1776-95	1811-30	Males.	Femlaes.
0— 5	160196	191818	167352	13660	15408	10956	14965	13342
5—10	122460	141557	138300	1672	1849	1111	1662	1544
10—15	118419	139842	123613	802	887	609	826	766
15—20	105845	131469	120327	714	812	658	750	728
20—25	102306	130006	111544	776	952	789	954	836
25—30	93315	119559	107476	872	1078	843	1001	931
30—35	87129	109408	98265	1058	1170	947	1071	1058
35—40	77077	95963	88040	901	1091	1029	1047	1007
40—45	70405	87697	82265	1129	1255	1071	1219	1152
45—50	59580	73856	70013	958	1132	1064	1235	1052
50—55	52689	68283	65475	1127	1289	1285	1393	1234
55—60	44211	57155	56391	1163	1401	1487	1412	1350
60—65	39416	48861	47286	1597	1867	1936	1665	1800
65—70	29610	34606	36473	1510	2019	2110	1653	1880
70—75	21776	22938	24066	1935	2062	2157	1580	2052
75—80	12515	12903	13210	1527	1612	1752	1175	1630
80—85	6418	6119	5617	1230	1099	1156	775	1162
85—90	2492	2150	1733	609	500	506	336	538
above 90	869	647	413	339	230	178	136	249
All Ages.	*1206728	1474837	1357859	33579	37713	31644	34855	34311
At Birth.	39976	48250	41675	867	1150	—	—	—
0—1	33640	41321	36394	8355	9174	7041	9617	8190
1—3	63005	75494	66658	3531	4181	2811	3657	3508
3—5	63551	75003	64300	1774	2053	1104	1691	1644

* The rate of increase of the Swedish population has been very regular—8 per cent every ten years. About 1-15th part of the living and dying were omitted during the 21 years 1755-75. The third observation, from 1811-30, is applicable to Sweden without Finland.

(5)—TABLE showing for three periods of 20 years each, the mean number dying annually out of 100 living in each quinquennial gradation of age,— being the results obtained by dividing the mean annual deaths by the mean number living as exhibited in TABLES 3 & 4.

Between Ages.	Males.			Females.			Mean annual rate for 61 years.			Theoretical Tables.		
	1755-75	1776-95	1811-30	1755-75	1776-95	1811-30	Males.	Females.	Both Sexes.	Village.	Mean.	City.
0— 5	*9.50	8.98	7.58	8.53	8.03	6.55	8.68	7.70	8.19	5.21	6.70	8.47
5—10	1.47	1.42	.86	1.37	1.31	.80	1.25	1.16	1.20	.77	.99	1.24
10—15	.76	.68	.52	.68	.63	.49	.65	.60	.63	.54	.65	.82
15—20	.72	.68	.55	.67	.62	.55	.65	.61	.63	.62	.75	.94
20—25	.95	.90	.87	.76	.73	.71	.91	.73	.82	.72	.87	1.08
25—30	1.06	1.06	.97	.93	.90	.78	1.03	.87	.95	.84	1.01	1.26
30—35	1.21	1.18	1.17	1.21	1.07	.96	1.19	1.08	1.14	.97	1.16	1.46
35—40	1.29	1.26	1.40	1.17	1.14	1.17	1.32	1.16	1.24	1.12	1.35	1.69
40—45	1.75	1.60	1.71	1.60	1.43	1.30	1.69	1.45	1.57	1.30	1.56	1.95
45—50	2.07	1.92	2.20	1.61	1.53	1.52	2.06	1.55	1.81	1.51	1.81	2.26
50—55	2.75	2.40	2.72	2.14	1.89	1.96	2.62	2.00	2.31	1.75	2.10	2.62
55—60	3.25	2.99	3.47	2.63	2.45	2.64	3.24	2.57	2.90	2.29	2.74	3.42
60—65	4.49	4.40	5.04	4.05	3.82	4.09	4.64	3.99	4.32	3.35	4.02	5.01
65—70	6.27	6.57	6.77	5.10	5.83	5.79	6.54	5.57	6.06	4.90	5.88	7.33
70—75	9.31	9.32	10.20	8.89	8.99	8.96	9.61	8.95	9.28	7.17	8.58	10.69
75—80	12.44	13.14	14.73	12.20	12.49	13.27	13.44	12.65	13.04	10.46	12.51	15.55
80—85	19.43	18.97	23.09	19.17	17.96	20.57	20.50	19.23	19.86	15.22	18.16	22.51
85—90	25.16	24.60	31.95	24.44	23 26	29.19	27.24	25.63	26.43	22.04	26.23	32.39
above 90	40.12	34.41	43.00	39.01	35.55	43.05	39.18	39.20	39.19	33.71	39.22	47.21
All Ages.	3.01	2.81	2.62	2.78	2.56	2.33	2.81	2.56	2.69	2.24	2.55	2.98
Born Dead.	2.82	3.10	——	2.17	2.38	——	——	——	——	——	——	——
0—1	28.52	25.81	22.82	24.84	22.20	19.35	25.72	22.13	23.92	9.47	12.05	15.05
1—3	5.78	5.74	4.62	5.60	5.54	4.22	5.38	5.12	5.25	5.40	6.88	8.61
3—5	2.90	2.85	1.79	2.79	2.74	1.72	2.51	2.42	2.46	2.46	3.13	3.92

*These numbers may be read without regarding the decimal points, by assuming the number living to be 10,000 at each age instead of 100.

(6)—TABLE Showing for each Sex, during 6 periods beginning with 1755 and ending with 1830, the mean number dying annually out of 100 living in each decennial interval of age. (From the year 1806 to 1830 Finland is not included.)

Between Ages.	21 years. 1755-75		20 years. 1776-95		5 years. 1801-05		5 years. War. 1806-10		10 years. 1811-20		10 years. 1821-30	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
0— 5	9.50	8.53	8.98	8.03	7.96	6.82	9.39	8.23	8.15	7.04	7.10	6.12
5—10	1.47	1.37	1.42	1.31	1.12	1.02	1.60	1.46	.96	.90	.77	.72
10—15	.76	.68	.68	.63	.54	.50	.98	.86	.58	.55	.46	.44
15—20	.72	.67	.68	.62	.57	.55	.95	.88	.62	.62	.49	.48
20—30	1.00	.84	.98	.81	.79	.70	1.38	1.04	.94	.80	.89	.70
30—40	1.25	1.19	1.22	1.10	.98	.96	1.63	1.41	1.27	1.13	1.29	1.00
40—50	1.89	1.61	1.75	1.48	1.55	1.32	2.28	1.88	1.88	1.44	1.99	1.36
50—60	2.97	2.36	2.66	2.14	2.83	2.23	3.79	3.08	3.12	2.42	3.00	2.13
60—70	5.22	4.50	5.28	4.66	5.25	4-61	6.81	6.04	5.92	5.07	5.64	4.61
70—80	10.44	10.10	10.63	10.25	11.78	10.74	13.61	12.76	11.53	10.51	11.95	10.47
80—90	21.00	20.64	20.37	19.34	23.76	22.86	28.01	26.77	25.00	23.36	25.02	21.93
above 90	40.12	39.01	34.41	35.55	38.06	44.23	38.59	47.09	39.70	41.21	46.41	44.73
All Ages.	3.01	2.78	2.81	2.56	2.57	2.33	3.33	3.02	2.72	2.44	2.54	2.23

Table 7.—Showing for each Sex, during two periods of 41 and 20 years, the mean annual rates of mortality in Sweden, at decennial intervals of age—with which are compared, the mean annual rates of mortality in England and Wales, during the 18 years 1813-30,—and the results of three Theoretical Tables deduced from the same formula by taking three different values of the mortality at the age of 12 years, in the proportions of 5, 6, 7½.

Between Ages.	Sweden and Finland 41 years, 1755-95.		Sweden 20 years 1811-30		England & Wales. 18 years 1813-30		Theoretical Tables.		
	Males.	Females.	Males·	Females.	Males.	Females.	Village.	Mean.	City.
0— 5	9.24	8.28	7.58	6.55	5.35	4.60	5.21	6.70	8.47
5—10	1.45	1.34	.86	.80	.72	.67	.77	.99	1.24
10—15	.72	.66	.52	.49	.50	.52	.54	.65	.82
15—20	.70	.65	.55	.55	.72	.76	.62	.75	.94
20—30	.99	.83	.92	.75	1.01	1.04	.78	.93	1.17
30—40	1.23	1.15	1.28	1.06	1.14	1.24	1.05	1.25	1.57
40—50	1.82	1.54	1.93	1.40	1.49	1.49	1.40	1.68	2.10
50—60	2.82	2.25	3.06	2.27	2.34	2 16	2.01	2.40	2.99
60—70	5.25	4.58	5.78	4.83	4.53	4.12	4.05	4.83	5.99
70—80	10.53	10.17	11.75	10.49	10.12	9.69	8.46	10.04	12.36
80—90	20.68	19.99	24.99	22.61	22.71	21.46	17.16	20.18	24.53
above 90	37.27	37.28	43.08	43.10	37.01	37.19	33.45	39.85	47.20
All Ages.	2.91	2.67	2.62	2.33	2.17	2.07	—	—	—
0—20	3.60	3.23	2.77	2.43	2.08	1.85	1.92	2.49	3.21
20—60	1.53	1.31	1.59	1.25	1.37	1.35	1.25	1.48	1.82
above 60	7.80	7.53	8.39	7.61	7.85	7.61	6.91	7.64	8.70
above 20	2.35	2.27	2.51	2.27	2.32	2.27	—	—	—

(8)—Table showing the *Vitality* of the Swedish population, indicated by the enumerations of the living, independently of the registers of deaths.—The numbers representing the proportions surviving in 1820 & 1830 out of every 100 enumerated at ages 10 years younger in 1810 & 1820. (No similar table of facts has yet been published.)

Age at first of two enumerations.	Surviving 10 years. {1820 1810		Surviving 10 years. {1830 1820		Surviving 10 years. Theoretical Tables.			Surviving 20 years. {1785 1765		Surviving 20 years. Mean Mortality.
	Males.	Females.	Males.	Females.	Village.	Mean.	City.	Males.	Females.	
0—10	88.8	89.2	92.0	92.8	90.3	87.9	85.0	75.7	82.2	81.1
10—20	93.5	97.2	92.5	95.0	93.5	92.2	90.4	80.3	85.3	82.7
20—30	*93.5	91.1	*90.6	91.5	‡91.3	89.7	87.3	*79.3	76.9	77.5
30—40	86.9	89.1	85.0	88.5	88.6	86.4	83.4	68.4	71.1	70.9
40—50	79.0	83.5	78.0	83.6	84.8	82.0	78.1	54.1	59.8	58.3
50—60	65.1	72.5	64.8	72.4	75.1	71.0	65.8	30.4	34.4	34.8
60—70	43.8	49.2	44.4	49.9	54.9	49.0	41.4	9.5	11.2	11.4
70—80	17.3	21.0	19.2	23.5	29.1	23.3	16.8	1.5	1.8	1.3
80—90	4.4	6.0	4.7	6.4	8.7	5.7	3.1	—	—	—

* These three numbers for the Male Sex are too high, in consequence of omissions of part of the Military and Naval population between the ages of 20 & 30 years.

‡ The Vitality indicated by the theoretical tables at ages above 20, will be found to correspond with the Vitality according to observation, in the same degree as the mortality indicated by these tables (and exhibited in Table 7) agrees with the mortality according to observation.

(9)—TABLE showing at 20 different ages, the coincidence between Mr. Milne's empirical Table for Carlisle, and a theoretical Table deduced from a simple mathematical formula. The numbers representing the survivors at quinquennial intervals, corresponding to 1,000 alive at the age of 10 years, assumed as a base in each case.

Age.	1	5	10	15	20	25	30	35	40	45
From Milne's Carlisle	1310	1052	1000	975	943	910	873	830	786	732
From Formula......	1311	1052	1000	973	943	910	873	831	786	736
Age.	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**
From Milne's Carlisle	681	630	564	467	372	259	148	69	22	4½
From Formula......	683	625	558	471	368	256	150	69	22	4

$$y_x = 10^{\frac{k^2 \alpha}{\lambda p}\left(1 - p^x\right)}$$ is

the formula representing the proportion surviving to any age (x) years; which, converted into logarithms, becomes

$$\log.\ y_x = \frac{k^2 \alpha}{\lambda p}\left(1 - p^x\right)$$

(α) is the only quantity required to be determined, at any one age, for different populations, and represents the annual rate of mortality when $x=0$, and $y=1$. (k) is the modulus of the common system of logarithms and $=.43429$. Log p and consequently (p) has three different values, one applicable in childhood, a second applicable between the ages of about 10 to 55 years, and a third at all ages above 55 years; The three determined values of log. p and p applicable to all tables of mortality are

$$\lambda p = \begin{cases} -.1700 \\ +.0128 \\ +.0333 \end{cases} \qquad p = \begin{cases} .6761 \\ 1.0299 \\ 1.0797 \end{cases}$$

The numbers in the theoretical table compared above, have been obtained by assuming (α) at the age of 10 years $=.05$, and by measuring (x) from the age of 10 years. On making the proper substitutions we shall have at the age of 55 from birth

$$y_{45} = 10^{\frac{k^2 \times .05}{.0128}\left(1 - \overline{1.0299}|^{45}\right)} = 10^{-.20386} = .625 \text{ as above.}$$

and so for any intermediate age from 10 to 55 years.

At the age of 35, when the third constant comes into operation, the annual rate of mortality is found by multiplying .05 by the second constant raised to the 45th power; that is, the new value of (α) =.1883. Consequently, for any age (20) measured from 55 the beginning of the third period, the proportion surviving will be represented by the formula

$$y_{20}=10^{\frac{k^2\times.1883}{.0333}\left(1-\overline{1.0797}|^{20}\right)}=10^{-.38772}=.410$$

That is .410 survives to the age of 75 out of one alive at the age of 55. Consequently, 625×.41=256 will represent the number surviving to the age of 75 out of 1,000 alive at the age of 10 years, as is stated in the above Table.

The first constant has been applied from the age of 1 to 9 years, in obtaining the numbers given above; but in the other theoretical Tables used for comparison, the age of 8 instead of 9 years has been adopted as the limit.